

CLAIMS

1. In a system including a pointing device, the system having an inactive state and an on state, apparatus including:
 - a plurality of sensors associated with the pointing device;
 - an on-off circuit coupled to the plurality of sensors and responsive to a triggering event involving any of those sensors;
 - a regulator coupled to the on-off circuit, responsive to a signal from the on-off circuit, and capable of being turned on or off in response to that signal;
 - an operational circuit coupled to the plurality of sensors and to the regulator, the operational circuit being responsive to whether the regulator is on or off, wherein the operational circuit can determine which one or more of the sensors is involved in any such triggering event;
 - wherein the system consumes substantially no power in its inactive state and operates normally in its on state.
2. Apparatus as in claim 1, wherein at least one of the following circuits consumes no more than about 1.5 microamp when the regulator is in its inactive state: the on-off circuit, the regulator, the operational circuit.
3. Apparatus as in claim 1, wherein each of the sensors is coupled to an identifiable resistor, a sensor signal indicative of a voltage drop across that identifiable resistor being coupled to the operational circuit.
4. Apparatus as in claim 1, wherein at least one of the plurality of sensors includes at least one of: a button, a pressure switch, a proximity circuit.

5. Apparatus as in claim 1, wherein the on-off circuit includes:
 - a bias element coupled to the plurality of sensors and providing substantially less than the full power output of the regulator;
 - each of the sensors being coupled to a distinguishable input of the operating circuit;
 - and
 - a switch coupled to the bias element, responsive to such a triggering event, and generating a signal from each of the sensors to the operating circuit.
6. Apparatus as in claim 1, wherein the on-off circuit is responsive to a turn-off signal from the operational circuit, and capable of being turned off in response to that turn-off signal.
7. Apparatus as in claim 1, wherein the system includes a shut-down state, the system entering the shut-down state in response to the operational circuit having detected one of the sensors having been associated with such a triggering event for at least a known time duration.
8. Apparatus as in claim 1, wherein the system includes an idle state, the system entering the idle state in response to the operational circuit having detected none of the sensors having been associated with such a triggering event for a known time duration.
9. In a system including a pointing device having a plurality of sensors, apparatus including:
 - a power source;
 - a regulator coupled to the power source;

an operational circuit coupled to the regulator;

a first sensor and a second sensor, each coupled to the operational circuit; and

an on-off circuit coupled to the regulator, the first sensor, and the second sensor;

wherein

the on-off circuit has an inactive state and an active state;

the on-off circuit uses substantially no energy in its inactive state;

the on-off circuit is capable of a transition from its inactive state to its active state in response to either the first sensor or the second sensor; and

the on-off circuit is capable of distinguishing, substantially immediately upon transition from the inactive state, whether that transition was in response to the first sensor or the second sensor.

10. Apparatus as in claim 8, wherein

the regulator has an inactive state and an active state;

the on-off circuit is capable of changing the regulator from its inactive state to its active state; and

the regulator uses substantially no energy in its inactive state.

11. A system as in claim 8, wherein

the on-off circuit is coupled to the operational circuit; and

the on-off circuit is responsive to a signal from the operational circuit, wherein the on-off circuit is capable of transitioning from its active state to its inactive state in response to that signal.

12. Apparatus as in claim 8, wherein the on-off circuit is coupled to the power source.
13. In a system including a pointing device having a plurality of sensors, a method of operating that system, including steps of:
 - receiving a relatively low voltage [V_{bias}], the relatively low voltage being substantially less than a normal regulated voltage [V_{cc}], but being sufficient to generate current in response to a triggering event involving any one or more of a plurality of sensors;
 - responsive to such a triggering event, generating a normal regulated voltage;
 - coupling each of the sensors to an operating circuit, whereby the operating circuit generates, in response to the normal regulated voltage, a signal indicative of which sensor was involved in the triggering event.
14. A method as in claim 13, wherein the steps of generating include steps of
 - altering a state of a switch in response to the triggering event; and
 - completing a circuit including that relatively low voltage and that switch, whereby a regulator receives a turn-on signal.
15. A method as in claim 13, wherein the steps of receiving include steps of coupling a bias element from a power source to an output of a regulator while that regulator is off.
16. A method as in claim 13, whereby the steps of coupling include steps of:
 - coupling each of the sensors between the relatively voltage and a corresponding resistor;
 - coupling each of the corresponding resistors to a common node, whereby the triggering event presents at least some current to the common node;

altering a state of a switch in response to that current, whereby that current presents a detectable voltage across the one resistor corresponding to which sensor was involved in the triggering event.

17. In a system including a pointing device having a plurality of sensors, a circuit including:

a relatively low voltage [V_{bias}], the relatively low voltage being substantially less than a normal regulated voltage [V_{cc}], whereby an operational circuit consumes substantially no power in response to the relatively low voltage [V_{bias}];

wherein the sensors are each coupled to the relatively low voltage [V_{bias}] and are each coupled to an identifiable resistive element, whereby the relatively low voltage [V_{bias}] generates a turn-on current through one of the identifiable resistive elements in response to a triggering event involving any of the sensors;

a regulator coupled to that turn-on current, the regulator being responsive to that turn-on current to turn on and provide the normal regulated voltage [V_{cc}];

coupling each of the identifiable resistive elements to an operating circuit, whereby the operating circuit generates, in response to the normal regulated voltage, a signal indicative of which sensor was involved in the triggering event.

18. A circuit as in claim 17, wherein the relatively low voltage [V_{bias}] has the effect of providing a current of about 0.5 microamps when none of the sensors are triggered.

19. In a system including a pointing device having a plurality of sensors, a circuit including:

a power source;

a bias element;

a switch corresponding to each sensor, the switch being closed when the sensor is triggered and open when the sensor is not triggered;

a resistive element corresponding to each such switch;

an operational circuit coupled to each such resistive element;

a node coupled to a plurality of those resistive elements; and

an on-off element responsive to a voltage at that node;

whereby the on-off element is responsive to any of the sensors being triggered, and a voltage drop across an identifiable one of the resistive elements allowing the operational circuit to generate a signal indicative of which one of the sensors was triggered.